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PORTABLE WIRELESS DEVICE AND SOFTWARE FOR PRINTING BY REFERENCE

FIELD OF THE INVENTION

A field of the invention is portable wireless devices. An additional field of the invention is printing.

BACKGROUND OF THE INVENTION

Portable wireless devices such as personal digital assistant (PDA) devices and portable wireless handsets, e.g., cell phones, enjoy widespread popularity. In particular, the portable, hand-held characteristics of these devices provide users with access to information and communication outlets in ways that were never before available. To ensure the continued popularity of portable wireless devices, attempts are being made to further expand the flexibility and capabilities of these portable wireless devices and to further enhance the services available to users of portable wireless devices. For example, portable wireless devices capable of accessing the Internet are available and Internet service providers that provide Internet access to portable wireless device users are becoming increasingly more common.

Unfortunately, the limited memory, display and bandwidth capabilities of portable wireless devices restrict the Internet content readily available to a portable wireless device user. Specifically, the Internet content available to the portable wireless device user is typically presented in a bare

1 bones format so that portable wireless device capabilities are conserved. As a
2 result, users will typically favor the richer Internet content available through
3 traditional Internet connections such as workstations and computers unless
4 circumstances such as travel prevent access to such computers. Thus, PDA
5 devices and wireless handsets are typically used either to access highly basic
6 content or to access content when circumstances prevent the user from
7 accessing content from another device.

8 Printing offers the opportunity for a user to view rich content, and
9 is often favored over viewing content through a full web browser or other
10 application on a personal computer or work station. Unfortunately, the
11 portable wireless devices, having limited capabilities, lack convenient printing
12 mechanisms. Moreover, connecting a portable wireless device to a printer via a
13 wired connection tends to defeat the purpose of having a portable wireless
14 device.

15 One answer to these concerns is found in efforts to have the
16 portable wireless devices communicate with peripherals and other devices
17 through wireless communications. The Bluetooth RF communication format is
18 directed toward expanding the utility of portable wireless devices by providing
19 a short range, typically about ten meters, communication channel for
20 communications between portable wireless devices and other Bluetooth
21 capable devices. However, standing alone, the communication channel offers
22 little to solve the print content dilemma faced by users of portable wireless
23 devices. Specifically, due to memory and bandwidth limitations portable
24 wireless devices are relatively poor portals to push content from or through to a
25 printer, even with the convenience of a Bluetooth or other similar wireless
26 communication capability.

27 BRIEF DESCRIPTION OF THE DRAWINGS

28 FIGURE 1 is a block diagram of a communication network
29 including a portable wireless device, a print device, an Internet content

1 provider and a print service;

2 FIG. 2 is a block diagram of the portable wireless device of FIG.
3 1;

4 FIG. 3 is a communication flow diagram illustrating a method for
5 performing a print by reference request;

6 FIG. 4 is a flow chart representing a method for discovering the
7 print device;

8 FIG. 5 is a communication flow diagram illustrating a method for
9 performing a print by reference request that involves supplying a security
10 access code to a print device;

11 FIG. 6 is a communication flow diagram illustrating a method for
12 performing a print by reference request that involves providing a security
13 access code to a print device in response to a security challenge from the print
14 device;

15 FIG. 7 is a communication flow diagram illustrating a method for
16 performing a print by reference request that involves providing a security
17 access code for use by the print device in accessing print content;

18 FIG. 8 is a communication flow diagram illustrating a method
19 for performing a print by reference request that involves providing a security
20 access code for use by a print service in accessing print content;

21 FIG. 9A is a communication flow diagram illustrating a method
22 for performing a print by reference request that involves providing a reference
23 to a print service and receiving print content from the print service at a portable
24 wireless device; and

25 FIG. 9B is a communication flow diagram illustrating a method
26 for performing a print by reference request that involves providing a reference
27 to a print service and causing the print service to deliver print content to a print
28 device for printing.

29 SUMMARY OF THE INVENTION

30 A portable wireless device wirelessly communicates with a print

1 device to thereby provide a reference that indicates the location of a desired set
2 of print content. In a typical preferred example, the portable wireless device
3 might obtain a reference to desired print content, e.g., a Universal Resource
4 Locator, while performing an operation such as web browsing over a wireless
5 network. The portable wireless device includes the print content reference in a
6 wireless communication signal to the print device which responds to the signal
7 by accessing the network, retrieving the desired print content and then printing
8 the desired print content. Alternatively, the print device may supply the
9 reference to a print service which may retrieve the desired print content and
10 format the desired print content for printing. The formatted content may then
11 be transmitted directly or indirectly to the print device for printing.

12 13 DETAILED DESCRIPTION

14 A simple form of the invention is a portable wireless device
15 having a set of wireless communication equipment that allows the portable
16 wireless device to communicate with a set of wireless communication
17 equipment disposed in a print device. The portable wireless device transmits a
18 reference indicating a location of desired print content to the print device
19 causing the print device to use the reference to obtain and print the desired print
20 content. The print device may obtain the print content from the Internet
21 content provider directly or may instead forward the reference to a print service
22 which obtains the print content from the Internet content provider, converts the
23 print content to a print ready format and then transmits the converted print
24 content back to the print device for printing.

25 26 I. THE PORTABLE WIRELESS DEVICE

27 Referring now to FIGs. 1 and 2, a portable wireless device 10
28 having print by reference capabilities may comprise, for example, a personal
29 digital assistant (PDA) or a mobile communication device that includes an
30 Internet interface 12 for providing access to an Internet content provider 14

1 and/or for providing access to an Internet/network based print service 16. The
2 Internet interface 12, although preferably able to support communication via
3 cellular telephony, may instead communicate with the Internet content provider
4 14 via any desired method, e.g., via satellite communication. Further, although
5 the portable wireless device 10 is described herein as enabling a print by
6 reference feature for obtaining print content from the Internet, the portable
7 wireless device 10 may be used to obtain print content from any type of
8 network including, for example, a local area network, a wide area network, and
9 an intranet. Thus, the Internet content provider 14 may represent any network
10 content provider and the Internet interface 12 may interface with any type of
11 network.

12 The portable wireless device 10 further includes an RF
13 communication interface 18 that allows the portable wireless device 10 to
14 communicate with an RF communication interface 20 disposed in a print
15 device 22 such as, for example, a printer or a multi-function peripheral
16 including a print function. Although, in a preferred embodiment the RF
17 communication interface 18 communicates with the print device 22 using a
18 Bluetooth wireless communication protocol and OBEX packet exchange
19 format, the RF communication interface 18 may instead communicate with the
20 print device 22 using any desired wireless protocol and packet format. For
21 example, in a preferred embodiment, the portable wireless device 10 may be
22 implemented with a Bluetooth enabled notebook computer having a Bluetooth
23 PC card manufactured by 3Com that operates according to the Bluetooth 1.1
24 specification and the print device 22 may be implemented using a Hewlett
25 Packard Deskjet 995c inkjet printer having integrated Bluetooth
26 communication capabilities.

27 As illustrated in FIG. 2, the portable wireless device 10 further
28 includes data processing and memory storage capabilities sufficient to enable a
29 print by reference feature that allows the portable wireless device 10 to cause
30 the print device to print print content. The data processing and memory storage

capabilities may be implemented using, for example, a processor 19 and a memory device 21 for storing software instructions and further using a temporary memory buffer 23. A set of software instructions stored in the memory device 21 and executed by the processor 19 enable the print by reference features described herein. In addition, any number of hardware components may further be used to supplement or even replace the processor 19, the software instructions and the memory devices 21, 23 provided that the print by reference feature is supported thereby. As will be appreciated by one having ordinary skill in the art, the processor 19 may be implemented using any suitable processor or controller capable of executing software instructions or otherwise controlling the portable wireless device 10 to enable the print by reference features described herein. Further, the memory devices 21, 23 may be implemented using any memory devices capable of storing data. The portable wireless device 10 further may include a display (not shown) for displaying data and a control panel (not shown) by which a user may interface with the portable wireless device 10.

II. A PRINT BY REFERENCE FEATURE

A. ESTABLISHING COMMUNICATION WITH A PRINT DEVICE

A set of methods are now described as being illustrative of the variety of ways in which the print by reference feature may be implemented. Further, the methods, which are described with reference to a set of figures, i.e., FIGs. 3 - 9A/B, are described as being implemented using the wireless portable device 10 in cooperation with the print device 22, the print service 16 and the Internet content provider 14 shown in FIGs. 1 and 2. Thus, an understanding of the methods described with respect to FIGs. 3 - 9A/B may additionally require reference to the components illustrated in FIGs. 1 and 2.

Referring now to FIG. 3, the print by reference feature may cause the portable wireless device 10 to execute a first print by reference method 24

1 for causing a set of desired web pages or other desired print content to be
2 printed. The first method 24 may begin when the portable wireless device 10
3 establishes communication with the print device 22 via the RF communication
4 interface 18. As will be understood by one having ordinary skill in the art, the
5 portable wireless device may perform any number of steps necessary to
6 establish communication with the print device 22 in accordance with the
7 communication protocol being used by the portable wireless device 10 and the
8 print device 22.

9 B. COMMUNICATING A REFERENCE TO A PRINT DEVICE

10 1. COMMUNICATING A REFERENCE

11 After receiving the communication signal, the print device 22
12 may respond by, for example, informing the wireless device 10 that
13 communication has been successfully established (step 28). In response, the
14 portable wireless device 10 may wirelessly communicate a reference that
15 identifies a location of the print content (step 30). Wirelessly communicating
16 the reference to the print device 22 may further include any number of
17 additional steps such as, for example, supplementing the reference with
18 additional data to support different levels of print content retrieval and printing.
19 For example, the reference may include only enough information to locate the
20 desired print content, e.g., a content locator or URL. Alternatively, the
21 reference may include a plurality of references, each reference representing
22 separate print content and a separate print document.

23 2. ADDING INFORMATION TO A REFERENCE

24 Still further, the reference may be supplemented to include a set
25 of extensions or attribute fields that allow additional information to be supplied
26 with the reference including, for example, a set of security access codes that
27 may be used in response to security challenges to gain access to the print
28 content, a URL that represents the location of a remote print service such as
29 print service 16 to be used in accessing and formatting the print content for
30 printing, and the time/date that the reference was sent to the print device 22.

1 Other attribute fields may be defined to include, for example, a label providing
2 a descriptive name for the location identified by the reference, a URL that
3 represents a proxy service required to access the print content referred to by the
4 reference, an internet address of the portable wireless device, an alternative
5 reference or address for obtaining the same or substitute print content, and data
6 indicating when print content should be printed beginning on a new sheet.
7 Further, attribute fields may be defined to include information used to restrict
8 access to the reference. For example, a type attribute may be defined to include
9 an encoding type that indicates how the print content at the location identified
10 by the reference is encoded. Further, a cookie attribute may be defined to
11 associate a print by reference print job with previous information concerning
12 reference content or a portable wireless device seeking to access referenced
13 content.

14 As a further example, the reference may include a billing attribute
15 that enables billing for services rendered. Specifically, any or all of the
16 Internet content provider 14, the print service 16 and/or the print device 22 may
17 require payment for usage thus requiring that each reference include
18 information that identifies the user of the portable wireless device 10 that
19 originated the print by reference request so that the user may be billed for the
20 services used. For example, the user may be provided with an account number
21 upon subscribing to the print service 16 or to the print device 22. Further, the
22 account number may be stored in the memory 21 disposed in the portable
23 wireless device 10 and the portable wireless device 10 may supply the account
24 number in an extension of the reference each time that a print by reference
25 request is executed. The print service 16 and print device 22 may verify that
26 the account number is valid before rendering service, i.e., before processing a
27 print by reference request for the user each time that a new print by reference
28 request is transmitted. As will be appreciated by one having ordinary skill in
29 the art, the reference extension may further be used to enable billing for
30 services rendered using any of a variety of other methods.

3. USING A REFERENCE TO OBTAIN PRINT CONTENT

After having received the reference, the print device 22 may respond by using the reference to download the print content associated with the reference from the Internet content provider 14, provided, of course, that the print device 22 is able to directly access the Internet content provider 14. Alternatively, the print device 22 may instead respond to the print request by providing the reference to a network/internet based print service 16 that retrieves the referenced print content from the Internet service provider 14, formats the referenced print content for printing and transmits the formatted pages to the print device 22 for printing.

C. RECEIVING/DISPLAYING STATUS INFORMATION

After communicating the reference, the portable wireless device may communicate a request for status information to the print device 22 (step 32). The print device may respond by communicating status information such as, whether the print content was successfully retrieved from the Internet and/or whether the print content was successfully printed (step 33). Alternatively, the print device 22 may transmit the status message to the portable wireless device 10 after the print content has been successfully retrieved and before the print content has been printed and therefore only provide status as to the retrieval of the print content.

Upon receiving the status information, the portable wireless device 10 may perform any number of tasks including, for example, automatically displaying the message, causing the message to be stored in the memory device 21 disposed in the portable wireless device 10 and sounding an alarm that alerts the user as to the presence of the message, or simply causing the message to be stored in the memory device 21 disposed in the portable wireless device 10 so that the user may retrieve the message at a convenient time. Alternatively, instead of communicating a request for status information, the wireless device may instead wait for the print device 22 to transmit the

1 status information automatically.

2

3 III. OBTAINING A REFERENCE

4 The reference specified in the print by reference request sent to
5 the print device 22 (step 28) may have been obtained by the user from the
6 Internet while using the Internet interface 12. Specifically, while using the
7 Internet interface 12 to surf the Internet, the user may encounter the desired
8 print content and, upon deciding to download the desired data, may cause the
9 portable wireless device 10 to store a copy of a URL identifying the location of
10 the desired print content into the memory device 21 disposed in the portable
11 wireless device 10. This may occur, for example, when the user clicks on a
12 hyperlink that causes the Internet content provider 14 to transmit a reference to
13 the portable wireless device 10 through the Internet interface 12. In addition,
14 selecting the hyperlink may further cause the wireless device 10 to invoke the
15 print by reference feature thereby causing the method 24 of FIG. 3 to be
16 performed using the reference obtained by selecting the hyperlink.

17 The reference supplied via the hyperlink may include additional
18 data concerning the printing of the associated print content including, for
19 example, the print policy of the Internet content provider 14. Specifically, the
20 additional data included by way of the hyperlink may limit the number of
21 copies of the requested print content that may be printed in response to the
22 current print by reference request. Further, the additional data included by way
23 of the hyperlink may include a reference identifying the location of a print
24 service 16 that is suited for obtaining and formatting the desired print content,
25 and may additionally include information associated with the cost of retrieving
26 the print content and/or the method of billing the user for retrieval. For
27 example, the reference may identify the location of the print service 16 by
28 including a URL or other network address that may be used to locate the print
29 service 16.

30 Alternatively, the URL may have been typed by the user directly

1 into the portable wireless device 10 for storing in the memory 21, or the URL
2 may have been stored in the memory device 21 by the user via a voice
3 recognition/recording feature. Instead, the URL may have been received at the
4 portable wireless device 10 via, for example, an e-mail message and then stored
5 in the memory 21. Regardless of the method by which the URL was obtained
6 or stored, the portable wireless device 10 may obtain the URL from the
7 memory device before performing the step of communicating the URL to the
8 print device 22 (step 28).

10 IV. METHODS FOR IDENTIFYING A PRINT DEVICE

11 A. IDENTIFYING A USER SPECIFIED PRINT DEVICE

12 Referring again to FIGs. 1 and 2, the print device 22 to which the
13 portable wireless device 10 forwards the reference for processing may be
14 determined using any number of methods. For example, the portable wireless
15 device 10 may be preconfigured to transmit the packet of data having the print
16 content reference to a specific print device 22 that is proximally located to the
17 user during the user's daily routine, i.e., a print device residing in the user's
18 office where the user spends most of the work day. As will be appreciated by one
19 having ordinary skill in the art, the portable wireless device 10 may be
20 preconfigurable using any number of methods, including for example, a menu
21 driven method wherein the portable wireless device 10 displays a print device
22 selection menu that allows the user to select one or more print devices 22.
23 Additionally, the portable wireless device 10 may supply a data input field in
24 which the user may specify a default or preferred print device 22.

26 B. A METHOD FOR DISCOVERING A PRINT DEVICE

27 Referring now to FIG. 4, in another embodiment, the portable
28 wireless device 10 may be configured to perform a method 37 for locating a
29 print device 22 by transmitting a discovery signal according to a conventional
30 local network discovery protocol. Specifically, a user may initiate the network

1 discovery protocol using, for example, a print device discovery command (step
2 39) which may cause the portable wireless device 10 to transmit discovery
3 signals that include an embedded request for information (step 41). The
4 portable wireless device 10 may then wait until a response is received from one
5 or more locally disposed print devices 22 (step 43).

6 As will be appreciated by one having ordinary skill in the art,
7 conventional network discovery features allow a user operating a network
8 device to discover other devices attached to the network. Further, the
9 discovery feature is typically defined at least in part by the communication
10 standard or specification associated with the network in use. Thus, the portable
11 wireless device may transmit discovery signals according to the
12 communication protocol for which the portable wireless device is configured.
13 For example, if configured to operate using a Bluetooth communication
14 protocol, the portable wireless device 10 may perform the discovery feature
15 using a Service Discovery Protocol defined in the Bluetooth communication
16 specification.

17 The responsive signals may include, for example, instructions
18 regarding the location of the responding print devices 22 so that the user may
19 proceed to the nearest print device 22 and cause the desired print content to be
20 printed thereon by initiating a print by reference request (step 45). The
21 responsive signals may further include information pertaining to the
22 capabilities of the responsive print device 22. For example, the responsive
23 signals may include information specifying whether the print device 22 has
24 color printing capabilities, whether the print device 22 is equipped for printing
25 specialized graphics files and further specifying the costs associated with using
26 the print device 22 to print a document. The portable wireless device 10 may
27 display the responsive information or otherwise communicate the information
28 to the user so that the user may determine which of the responding print
29 devices 22 to select. Of course, if no responsive signals are received at the
30 portable wireless device 10, the portable wireless device 10 may again transmit

1 print device discovery signals (step 41) for any number of times, until a
2 responsive signal is received, or until the user halts the print device discovery
3 method 37.

4 The print device discovery feature may be especially useful for
5 the traveling user who frequents airports or other public places that may
6 include, for example, kiosks equipped with print devices 22 for use by airport
7 visitors. Thus, the responding print device 22 may provide the user with an
8 airport terminal name and gate at which the kiosk is located.

9 As will further be appreciated by one having ordinary skill in the
10 art, the portable wireless device 10 may initiate a network discovery protocol in
11 response to any number of user inputs. For example, the portable wireless
12 device 10 may display a menu having a plurality of options wherein one of the
13 available options allows the user to initiate the network discovery protocol.
14 Alternatively, the portable wireless device 10 may be equipped with a control
15 switch or button that, when depressed by the user, causes the network
16 discovery protocol to be invoked and when depressed a second time causes the
17 network discovery protocol to be halted. Instead, the portable wireless device
18 10 may be configured to automatically invoke the network discovery protocol
19 every time the portable wireless device 10 is powered up or every time a print
20 by reference request is initiated.

21 22 V. PRINT BY REFERENCE METHODS REQUIRING SECURITY 23 ACCESS CODES

24 A. TRANSMITTING A SECURITY ACCESS CODE UPON 25 ESTABLISHING COMMUNICATION

26 Referring now to FIG. 5, the first method for performing a print
27 by reference request may be modified to allow for the transmission of security
28 information by the portable wireless device 10 and thereby enable access to an
29 otherwise restricted-access print device 22 and/or to enable access to secure
30 print content. More particularly, when performing a print by reference request,

1 the portable wireless device 10 may further transmit one or more security
2 access codes that enable access to a print device 22 and/or the Internet content
3 provider 14. Thus, a print by reference method 44 involving the transmission
4 of security information required to access the print device 22 may begin when
5 the portable wireless device 10 establishes communication with the print device
6 22 (step 46) and provides a security access code that allows access to the print
7 device 22.

8 Upon receiving the access code from the portable wireless device
9 10, the print device 22 verifies that the proper access code has been supplied
10 and, if the proper access code has been received, then responds to the portable
11 wireless device 10 with a message that indicates that communication has been
12 successfully established (step 48). After being informed that communication
13 has been established, the portable wireless device 10 may respond by
14 transmitting a reference that indicates the location of the desired print content
15 (step 50). Thereafter the print device 22 either accesses the print content
16 directly via the Internet content provider 14 or instead supplies the reference to
17 the print service 16 so that the print service 16 may retrieve and format the
18 print content as described above.

19 After communicating the reference the wireless device 10 may
20 communicate a request for status information (step 52) to the print device 22
21 which may respond by sending the status information (step 53). The wireless
22 device 10 may then receive and store the status information or display the
23 status information for viewing by the user.

24
25 B. TRANSMITTING A SECURITY ACCESS CODE IN
26 RESPONSE TO A SECURITY ACCESS CHALLENGE

27 Referring now to FIG. 6, the portable wireless device 10 may
28 instead be configured to withhold the security access code required to control
29 the print device 22 until prompted according to yet another method 54 that
30 begins when the portable wireless device 10 establishes communication with

1 the print device 22 (step 56). The print device 22 processes the request to
2 establish communication and responds with a security challenge indicating that
3 the wireless device 10 is not authorized to use the print device 22 (step 58). In
4 response, the portable wireless device 10 may again attempt to establish
5 communication with the print device 22, this time providing the access code
6 required by the print device 22 (step 60). The print device 22 verifies the
7 access code and, if proper, supplies a message to the portable wireless device
8 10 indicating that communication has been successfully established (step 62).
9 Of course, if the access code is improper, the print device 22 may again
10 indicate that the portable wireless device 10 is not authorized to use the print
11 device (step 58).

12 Once communication has been successfully established, the
13 portable wireless device 10 communicates the reference associated with the
14 desired print content to the print device 22 for processing (step 64). The print
15 device 22 then uses the reference to download and print the desired print
16 content from the Internet content provider 14. Alternatively, the print device
17 22 supplies the reference to the print service 16 for retrieval and formatting as
18 described above.

19 Alternatively, the steps of re-attempting to establish
20 communication with the print device 22 (step 60) and communicating the
21 reference (step 64) may be performed in a single step. Specifically, in response
22 to the security challenge, the wireless device 10 may communicate the
23 reference having the security access code to the print device 22. The print
24 device 22 may respond to the reference by verifying the security access code
25 and then obtaining and printing the print content.

26 After the print by reference request has been processed, the print
27 device 22 may supply a status message to the portable wireless device 10
28 indicating whether the print by reference request has been successfully
29 processed (step 66).

30

1
2 C. TRANSMITTING A SECURITY ACCESS CODE TO GAIN
3 ACCESS TO PRINT CONTENT VIA A PRINT DEVICE

4 Referring now to FIGs. 7 and 8, the portable wireless device 10
5 may further supply a security access code to gain access to the print content.
6 Specifically, assuming that the portable wireless device 10 has successfully
7 established communication with the print device 22, then, in accordance with a
8 set of methods 70, 72 shown in FIGs. 7 and 8, respectively, the portable
9 wireless device 10 may communicate the reference to the print device 22 (steps
10 74, 76). Next, the print device 22 forwards the reference to either the print
11 service 16 (step 78; see FIG. 8) or the Internet content provider 14 (step 80; see
12 FIG. 7) depending on whether the print device 22 is configured to access the
13 Internet content provider 14 directly or whether the print device 22 is instead
14 configured to access the print service 16. If supplied directly to the Internet
15 content provider 14 as shown in FIG. 7, then the Internet content provider 14
16 may attempt to retrieve the desired print content residing at the location
17 represented by the reference. If a security access code is required to access the
18 desired print content, the website at which the desired print content is located
19 may respond to the attempted retrieval of the desired print content with a
20 security challenge thereby requesting that a security access code be supplied.

21 The Internet content provider 14 causes the request for a security
22 access code to be transmitted back to the print device 22 (step 82) which, in
23 turn, supplies the request to the portable wireless device 10 (step 84). The
24 portable wireless device 10 may respond to the request by transmitting a
25 reference including the required security access code to the print device 22
26 (step 86). The print device 22 then supplies the security access code to the
27 Internet content provider 14 (step 88) which uses the access code to enable
28 access to the print content. Provided that the security access code is
29 acceptable, the Internet content provider 14 forwards the desired content to the
30 print device 22 for formatting and printing therein (step 90). In addition to

1 printing the desired print content, the print device 22 may transmit a message to
2 the portable wireless device 10 indicating that the desired print content has
3 been successfully retrieved and printed (step 92).

4
5 D. TRANSMITTING A SECURITY ACCESS CODE TO GAIN
6 ACCESS TO PRINT CONTENT VIA A PRINT DEVICE AND
7 A PRINT SERVICE

8 If, instead, the reference is supplied by the portable wireless
9 device 10 to the print service 16 as shown in FIG. 8 (step 78), then the print
10 service 16 uses the reference to attempt to access the desired print content via
11 the Internet content provider 14 (step 94). As described with respect to FIG. 7,
12 the Internet content provider 14 may attempt to retrieve the desired print
13 content residing at the location represented by the reference. If a security
14 access code is required to access the desired print content, the website at which
15 the desired print content is located may respond to the attempted retrieval of
16 the desired print content with a security challenge thereby requesting that a
17 security access code be supplied before access to the desired content is granted.

18 The Internet content provider 14 causes the request for a security
19 access code to be transmitted back to the print service 16 (step 96) which, in
20 turn, supplies the request to print device 22 for routing to the portable wireless
21 device 10 (steps 98, 100). The portable wireless device 10 may respond to the
22 request by transmitting a reference including the required security access code
23 (step 102) to the print device 22. The print device 22 may then supply the
24 security access code to the print service 16 (step 104) which may use the
25 security access code to access the desired print content via the Internet content
26 provider 14 (step 106). Provided that the access code is acceptable, the Internet
27 content provider 14 allows the print service 16 access to the desired print
28 content (step 108). The print service 16 thereafter formats the print content for
29 printing and then forwards the formatted print content to the print device 22 for
30 printing (step 110). In addition to printing the desired print content, the print

device 22 may transmit a message to the portable wireless device 10 indicating that the desired print content has been successfully retrieved and printed (step 112).

Instead of withholding the security access code until prompted, the portable wireless device 10 may instead transmit the relevant security access code with the reference thereby eliminating the need for the Internet content provider 14 to request that the desired security access code be provided and thus eliminating the need to send the request from the Internet content provider 14 back to the portable wireless device 10 via the print service 16 and print device 22. Similarly, when a plurality of references, each having a different security access code, are transmitted to the print device 22 via a single print by reference request, the portable wireless device 10 may similarly be configured to either transmit the security access codes with the references or to withhold each security access code until a request for the access codes, either individually or jointly, is received from the print device 22.

VI. METHODS FOR OBTAINING PRINT CONTENT VIA A PRINT SERVICE

A. DOWNLOADING PRINT CONTENT FROM A PRINT SERVICE TO A PRINT DEVICE VIA A PORTABLE WIRELESS DEVICE

Referring now to FIG. 9A, in yet another embodiment, instead of sending the print by reference request to the print device 22, the portable wireless device 10 may communicate directly with the print service 16. Specifically, according to yet another method 114A, the portable wireless device 10 may communicate the reference to the print service 16 (step 116) which may respond by retrieving the desired content via the Internet content provider 14 (steps 117, 119). The print service 16 may then format the print content for printing and transmit the formatted print content to a specified print device 22 (step 118A). The identity of the print device 22 may have been

1 specified, for example, in the reference.

2 Provided that the print device 22 has the capability to convert the
3 print content to a print ready format, the print service 16 may instead supply
4 the print content to the print device 22 in a non-print ready format, in which
5 case, the print device 22 will be required to perform any format conversions
6 necessary to enable printing of the print content.

7

8 B. DOWNLOADING PRINT CONTENT FROM A PRINT
9 SERVICE TO A PRINT DEVICE

10 Referring also to FIG. 9B, according to still another method
11 114B, the print service 16 may transmit the print ready print content back to the
12 portable wireless device 10 (step 118B) which may then cause the print ready
13 print content to be forwarded for printing to a print device 22 of choice using a
14 method similar to the method shown in FIG. 3. More particularly, the portable
15 wireless device 10 may establish communication with the print device 22 (step
16 120) and, after communication has been established, may transmit the
17 formatted print content to the print device 22 accompanied by a print request
18 that causes the print device 22 to respond by printing the print content (step
19 122). Further, the print content received at the portable wireless device 10 is
20 preferably communicated to the print device 22 using a store and forward
21 operation, e.g., streaming, which may be performed using any of a variety of
22 steps including temporarily storing the data received from the print service 16
23 in the memory buffer 23 disposed in the portable wireless device 10 and then
24 converting the buffered data to a format suitable for transmission via the RF
25 interface 18. After printing the print content, the print device 22 may transmit
26 a status message indicating that the content has been printed (step 124).

27 The portable wireless device 10 may further receive one or more
28 error messages from one or more of the print device 22, print service 16 or the
29 Internet content provider 14. Moreover, the portable wireless device 10 may
30 perform any of a variety of desired tasks in response to any of the received

1 error messages. For example, upon receiving an error message indicating that
2 communication was not successfully established, the portable wireless device
3 10 may make any number of further attempts to establish communication. In
4 addition, upon receiving a security access code error, the portable wireless
5 device 10 may resend the required security access code. Further, in response to
6 an error message indicating that the reference does not exist or cannot be
7 accessed, the portable wireless device 10 may display a message informing the
8 user as to the inaccessible status of the reference. A message may also be
9 displayed by the portable wireless device 10 when a status message is received
10 from the print device 22 indicating the content of the status message.

11 From the foregoing description, it should be understood that a
12 portable wireless device having a print by reference feature has been shown
13 and described, having many desirable attributes and advantages. In particular,
14 the portable wireless device provides a user with print capabilities.
15 Specifically, the portable wireless device transmits a reference corresponding
16 to a location at which desired network content is located to a print device. The
17 print device, in turn, either accesses a network content provider to retrieve the
18 desired network content or instead forwards the reference to a print service
19 which accesses a network content provider to retrieve the desired network
20 content. After retrieval, the print service formats the network content for
21 printing and then delivers the formatted network content to the print device for
22 printing. Likewise, if retrieved by the print device, the network print content is
23 adapted for printing and then printed by the print device.

24 As will be appreciated by one having ordinary skill in the art,
25 network security devices such as network firewalls typically prevent the
26 reception of print content or any other information from the Internet at a user
27 device unless initiated by the user. In some cases, the portable wireless device
28 10 may initiate a print by reference request and then act as a conduit to transfer
29 the print content to the print device 22. In that case, the portable wireless
30 device 10 may supply or push data to the print device 22 or the print service 16.

1 In either case, data transferred from the Internet content provider 14 or the print
2 service 16 to either of the portable wireless device 10 or the print device 22 is
3 preferably performed using a data download or data pull operation wherein the
4 data transfer is initiated by either the portable wireless device 10 or the print
5 device 22. This avoids the firewall problem. Of course, if network security is
6 not an issue, a data transfer may occur in any other manner. Likewise, data
7 transferred from the portable wireless device 10 to the print device 22 may be
8 pushed or uploaded from the portable wireless device 10 to the print service 16
9 and to the print device 22.

10 While various embodiments of the present invention have been
11 shown and described, it should be understood that other modifications,
12 substitutions and alternatives are apparent to one of ordinary skill in the art.
13 For example, in addition to having data processing and memory storage
14 capabilities sufficient to enable a print by reference feature, the portable
15 wireless device may further include data processing and memory storage
16 capabilities that enable a variety of other tasks. For example, the portable
17 wireless device may include data processing and memory storage capabilities
18 that allow the portable wireless device to function as a telephone, a personal
19 computer, or to instead function as a personal assistant.

20 Further, although the print by reference feature is described as
21 being implemented through the execution of a set of software instructions, the
22 print by reference feature may instead be implemented using hardware or a
23 combination of hardware and software.

24 Such modifications, substitutions and alternatives can be made
25 without departing from the spirit and scope of the invention, which should be
26 determined from the appended claims.

27 Various features of the invention are set forth in the appended
28 claims.